THE ADVISORY COMMITTEE ON THE DEPRECIATION OF INDUSTRIAL MACHINERY AND EQUIPMENT

November 22, 1982

TABLE OF CONTENTS

Introduction	1
The Issue	2
Terms of reference	4
The Concept of Depreciation	5
Current Depreciation Techniques	9
Summary of Advisory Committee Meetings	12
Background to Recommendations	13
RECOMMENDATIONS	22
Appendixes	
Appendix 1: Membership of the Committee	30
Appendix 2 Comparison of Depreciation Proposals	31
Appendix 3 Submissions Canadian Petroleum Association/ Independent Petroleum Association of Canada/Canadian Property Tax Agents Association	33
Rural Assessors Association	46
Assessment Services Division	49

INTRODUCTION

Over a period of some 30 years, the Department of Municipal Affairs has been involved in developing uniform methods for valuing property for municipal taxation purposes.

To this end several Assessment Manuals have been produced for the express purpose of providing Province-wide standards and guidelines to meet the challenge of fair and equitable property assessments. The objective is to provide equity among classes of property as well as for each municipality within the Province.

To achieve a reasonable degree of uniformity, the assessment guidelines for improvements to land have been based on the concept of replacement cost new, the cost to replace an improvement with a modern unit in new condition and of equivalent utility.

It is universally accepted that as an improvement ages its ability to provide services, and thus its value declines. When the replacement cost new method of valuation is used this age-related loss of value is measured by depreciation. Thus allocations for depreciation are an integral element in the preparation of assessments for property taxation purposes in Alberta.

THE ISSUE

To meet the objective of equitable assessments it is as necessary to establish equitable standards for measuring depreciation as it is to develop rates for estimating replacement cost new.

Each successive Manual has provided guidelines to assist in the estimation of the loss in value of an improvement which is attributable to normal physical wear and tear as well as to normal functional obsolescence.

Abnormal functional and/or economic obsolescence, if present, are additional factors and must be estimated on an individual basis through examination of the exceptional forces, internal or external, which may affect the value of the improvement.

The Depreciation Tables contained in the 1979 Assessment Manual are based primarily on a survey which measured the impact of depreciation on those classes of property which normally trade on the open market.

Industrial plants, along with the machinery and equipment used for manufacturing or processing are not sold frequently. In the case of machinery and equipment there is, apart from initial purchases, little trading of operating units upon which to establish values with a given state of usefulness.

In response to the lack of market information numerous depreciation schedules have been adapted for use with various classes of machinery and equipment. These schedules range from declining balance, to straight line, to fixed and immediate allocations. The lack of uniform guidelines has led to different depreciation procedures being applied to similar machinery and equipment in the various assessment jurisdictions of the Province.

These historic discrepancies are unacceptable to the Department. The advisory committee was established in order to assist in the formulation of an appropriate procedure for depreciating industrial machinery and equipment.

TERMS OF REFERENCE

The terms of reference of the Advisory Committee, as incorporated in this report, are as follows:

" (i) to review the age life estimates used by the (Assessment) Division and recommend appropriate changes.

(ii) to review the depreciation methodology used by the Division and recommend appropriate policies and procedures.

(iii) to recommend a policy for the depreciation of buildings housing machinery and equipment. " *

* quoted from the letter of invitation sent to the members of the Committee. Membership of the Committee is given in Appendix 1.

THE CONCEPT OF DEPRECIATION

Depreciation is a particularly complex valuation concept and it is important that the meaning of the more important terms be defined.

Depreciation:	loss in value from physical deterioration and from obsolescence. The total depreciation is the difference between 'typical' cost and market value at the same date
Economic life/age life:	the estimated period of time over which a new structure is reasonably expected to be competitive in the market
Effective age:	the estimated age of a structure based on the use and care it has received

Annual normal physical and functional depreciation is measured by the application of a mathematical formula that best represents the rate at which an improvement actually loses value.

In order to apply depreciation it is necessary to know the replacement cost new, age life and effective age as well as to select a depreciation table.

Assume:	replacement cost new	$140,000
	age life	20 years
	effective age	8 years
	depreciation table	straight line

Age	Percent Depreciation	Amount Depreciation	Depreciated Value
0	0	0	$140,000
-			
8	40% (8 - 20 x 100)	$56,000	$84,000
-			
-			
20	100	$140,000	0

This basic model does not recognize that in a typical industrial plant the machinery and equipment is being continually added to or removed (additions and retirements). These changes must be monitored and reflected in the measurement of depreciation.

Assume: as of 1982

1970 - initial investment of $140,000

1970-82 - $40,000 of initial investment retired

1978 - addition of $50,000

1978-82 - $10,000 of addition retired

age life - 20 years

depreciation table - straight line

YEAR	ADDITION	RETIREMENT	NET COST	PERCENT DEPRECIATION	AMOUNT DEPRECIATION	DEPRECIATED VALUE
1970	$140,000	$40,000	$100,000	60% (12-20x100)	$60,000	$40,000
1978	50,000	10,000	40,000	20% (4-20x100)	8,000	32,000
TOTAL 1982	190,000	50,000	140,000		68,000	72,000

The final steps in the process, the conversion of the value to a final assessment through the application of cost indices and the statutory 65% assessment level, have been omitted as they are not an integral part of the depreciation calculation.

The selection of their most appropriate depreciation procedure for assessment purposes has traditionally required a trade-off between the costs of detailed data collection required for precise measurement and efficient administrative

procedures required for mass appraisal. A depreciation procedure that measures the loss in value in a manner that is theoretically precise may be too costly for the improvements in property tax equity which would result from its application.

CURRENT DEPRECIATION TECHNIQUES

At the present time in Alberta the depreciation applied to industrial machinery and equipment is dependant firstly upon whether it is assessed under the Municipal Taxation Act or the Electric Power and Pipeline Act. The second major distinction is whether the 1967 Assessment Manual (Alta. Reg 372/67) or the 1979 Assessment Manual (Alta. Reg 394/79) is used to make the assessment. The third consideration is whether the municipality was assessed under the indexing (one for one) regulation (Alta. Reg 136/77 for assessments made under the MTA) and (Alta. Regs 262/77 and 263/77 for EPPA assessments). Specifically, the statutorily determined differentials are:

(a) Municipal Taxation Act; 1967 Manual

(b) Municipal Taxation Act; 1967 Manual - one to one

(c) Municipal Taxation Act; 1979 Manual

(d) Electric Power and Pipeline Ac · 1967 Manual

(e) Electric Power and Pipeline Act; 1967 Manual - one to one

(f) Electric Power and Pipeline Act; 1979 Manual

The depreciation standards for each of these categories are as follows:

(a) M.T.A.; 1967 Manual

- age life schedule
- declining balance table

(b) M.T.A.; one to one regulation

- age life schedule
- inverse 'S' curve

(c) M.T.A.; 1979 Manual

- age life schedule
- inverse 'S' curve

(d) E.P.P.A.; 1967 Manual

(i) generating plant & machinery

- 5% per annum
- maximum 50% depreciation

(ii) electric power distribution/transmission

- fixed at 50%

(iii) pipeline distribution/transmission/well pipe

- fixed at 50% depreciation

(iv) well head

- 10% per annum
- maximum 50% depreciation

(e) E.P.P.A.; one to one regulations

(i) generating plant and machinery

- age life schedule
- inverse 'S' curve

(ii) electric power distribution/transmission

- fixed at 25% depreciation

(iii) pipeline distribution/transmission/well pipe

- fixed at 25% depreciation

(iv) well head

- fixed at 25% depreciation

(f) E.P.P.A.; 1979 Manual

(i) generating plant and equipment

- age life schedule
- inverse 'S' curve

(ii) electric power distribution/transmission

- fixed at 25%

(iii) pipeline distribution/transmission/well pipe

- fixed at 25%

(iv) well head

- fixed at 25%

SUMMARY OF ADVISORY COMMITTEE MEETINGS

Since the first meeting in March 1981 the Advisory Committee has dealt with only two sectors of industry, electrical power generation and oil and gas production. Although the Committee received one inquiry with respect to meat packing plants, it is these industries that have occupied the majority of the committee deliberations. In fact, fully ninety percent of the committee's attention has been devoted to the oil and gas industry.

Three written submissions were received by the Committee. The briefs, from the Canadian Petroleum Association/Canadian Property Tax Association/ Independent Petroleum Association; the Rural Assessors Association and the Assessment Services Division of Alberta Municipal Affairs are appended to this report. The positions subscribed to in each of these submissions are summarized in Appendix B. In addition Dan Levson of Transalta Utilities submitted a proposal for a flexible depreciation policy dependant on the ability of industry to provide detailed information on machinery costs, installation dates and retirements. The committee, which benefited significantly from Mr. Levson's thorough knowledge of depreciation theory and its application in particular to the electric power industry, agreed that the data requirements for such a flexible policy can not be met by most companies at this time.

BACKGROUND TO RECOMMENDATIONS

It became clear in the early meetings of the Committee that the major issue to be resolved was whether depreciation of oil and gas production facilities should be measured using the accepted concepts of age life and tables or be determined arbitrarily through application of fixed and immediate depreciation allowances.

FIXED AND IMMEDIATE DEPRECIATION

The issue of fixed and immediate depreciation; that is the application of a permanent depreciation allowance as soon as the depreciable asset is assessed, was discussed in considerable detail by the Committee.

A number of advantages, as well as objectionable features of fixed and immediate depreciation were identified by the Committee.

ARGUMENTS IN FAVOUR OF FIXED AND IMMEDIATE DEPRECIATION

Precedent

Fixed and immediate depreciation of 25% is currently applied to machinery and equipment assessed under the Electric Power and Pipe Line Act. Among the assessments that are depreciated in this manner are: electric power transmission and distribution lines, oil and gas transmission and distribution pipe lines and oil and gas well head equipment, cable television systems and A.G.T. facilities.

Stability of the Tax Base

In the absence of any other changes in assessment, the current system of depreciation whereby an annual allowance is applied to machinery and equipment will reduce the size of the municipal tax base. In a period of low economic activity where assessment growth is minimal, mill rates must rise to meet constant expenditures in those municipalities where machinery and equipment form a significant proportion of the tax base. Fixed and immediate depreciation of machinery and equipment would eliminate this annual reduction in the base.

Workload

The repetitive calculations required to provide for annual depreciation are tedious and provide numerous opportunities for mechanical and interpretive errors.

Machinery and equipment at many sites is in a continuous state of flux with replacements, additions and retirements being made on a routine basis. The net effect of these changes on the assessment is often not significant. Nevertheless, a major effort is required of the assessor to account for the changes. The bulk of this effort would be removed if fixed and immediate depreciation were used.

Accuracy

It has been suggested by a number of experts involved with valuation, including members of this Committee, that there is inadequate data available to support determination of either age life tables or depreciation tables for most machinery and equipment. If this is true, then fixed and immediate depreciation is no more arbitrary than any other method of depreciation.

Policy Implementation

Fixed and immediate depreciation, with only one calculation in the assessment valuation process, will facilitate the simulation of tax change impacts.

ARGUMENTS AGAINST FIXED AND IMMEDIATE DEPRECIATION

Precedent

A far greater proportion of assessment in Alberta is depreciated on the basis of age life and depreciation tables than by means of fixed and immediate depreciation. These flexible depreciation procedures are universally accepted for buildings and structures as an integral part of an *ad valorem* tax system.

Stability of the Tax Base

Since the property tax in Alberta is *ad valorem*, the assessment base should be reduced if value declines. It is preferable to increase the frequency of general assessments or to modify the depreciation of buildings than to reduce the accuracy of the assessment through the expanded use of fixed and immediate depreciation.

Workload

Improved administrative procedures through the use of automated systems will eliminate the current difficulties with calculations. The Department will have a computerized industrial assessment system available for use in 1984. This system will be made available to all municipalities with their own assessment departments either directly or as a prototype.

It is worth noting that, even with fixed and immediate depreciation, assessors must continue to make a major effort to identify, classify and value machinery and equipment.

Accuracy

The depreciation of machinery and equipment for valuation purposes has not been widely investigated by assessors. Data is lacking and theory is minimal; nevertheless, the experience of accountants and engineers is available and is being reviewed in greater detail.

The assessment system should not adopt arbitrary procedures, such as fixed and immediate depreciation, with its attendant inaccuracy until all options have been considered. It has not been demonstrated conclusively that it is impossible to measure the depreciation of machinery and equipment accurately. Unless it is demonstrated the more flexible methods of depreciation should continue to be used.

Policy Implementation

The relative ease with which assessments based on fixed and immediate depreciation can be varied through simulation potentially exposes the system to more frequent statutory changes than would otherwise be the case.

CONCLUSION

The inflexible and arbitrary nature of fixed and immediate depreciation, which effectively removes the element of judgement from the assessment process, is of great concern to the Committee. A widespread application of fixed and immediate depreciation would convert the property tax from an ad valorem* tax to the equivalent of a poll tax. The Committee believes that such a change should come only as a result of public debate and explicit legislation, not through technical changes in assessment procedures.

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* According to value

The major advantage of fixed and immediate depreciation identified by the Committee is improved administrative efficiency. It is our view that with the introduction of automated systems anticipated by the Department, this argument loses its force entirely.

The Committee believes that, on balance, the difficulties with fixed and immediate depreciation outweigh its advantages. Rather than extending its use, the Government should consider eliminating its application to facilities, for which age life data is available.

OTHER ISSUES

Having rejected fixed and immediate depreciation, the issues that the Committee had to address in considering depreciation from the perspective of accepted valuation theory were: age life, depreciation tables, residual values, the treatment of additions and the treatment of buildings housing the machinery.

Age Life

Age life is the anticipated useful life of the machinery at the time of installation. Age life is a function of the physical characteristics of machinery and economic factors associated with the output produced by the machinery. For example, the oil and gas industry bases its investment decisions on a 20 year life for oil and gas fields. Logically, the age life of production field machinery and equipment* should reflect the anticipated

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*Defined for purposes of this report to include well pipe and surface equipment oil, gas and water flow, gathering and injection lines; batteries, gas plants and all other facilities used in connection with the development and depletion of oil and gas fields.

life of the field. The actual period of time that the machinery remains in use may be less than the age life or it may exceed the age life. In either instance, depreciation can be modified by applying allowances for abnormal depreciation or by extending the remaining life estimate.

Depreciation Tables

The pattern of depreciation is represented by depreciation tables intended to show the annual rate at which the machinery loses value. For machinery and equipment, the pattern of depreciation should be based on the actual experience of installations and retirements.

Based on records of installations and retirements, tables are developed that show the survival history of the machinery. These survivor curves are converted to depreciation tables to show the proportion of remaining life for machinery for a given average age life.

Residual Value

The residual value of machinery is the value assumed to be remaining at the end of its projected age life. The Committee supports the view that, regardless of the method of depreciation used, some value should be attributed to machinery so long as it remains in use. It is possible for a residual value to be negative if the cost of removal exceeds the value in an alternative use or the scrap value.

Additions

The machinery installed initially does not remain constant through the life of the facility. Over and above the requirements of maintenance, machinery and equipment is in a continual process of change through replacements, additions and retirements. The depreciation of additions has posed a difficult problem for the Committee to resolve.

One alternative for depreciating additions to machinery is to estimate the remaining life at the time of the general assessment. Between general assessments, annual depreciation would be based on the remaining life of the entire facility.

Such a procedure requires an analysis of data and a degree of familiarity with industrial processes not available generally to assessors in Alberta.

Alternatively, additions can be depreciated on the basis of the "zero start" procedure whereby each addition or replacement that extends the remaining life of the facility and machinery previously installed, is depreciated on the basis of the full age life of the facility. The impact of the zero start procedure is illustrated in the following example:

ZERO START DEPRECIATION

INDUSTRIAL PLANT

(AS OF 1980)

Age Life		15 years
Year Built		1956
Actual Age		24 years

ORIGINAL COST		$16.0 million
NEW ADDITIONS AND DELETIONS		
1956 THROUGH 1980	$23.4	
CURRENT COST		$39.4
TOTAL DEPRECIATION	$22.9	
NET COST		$16.5
INDICATED PERCENT REMAINING		41.9%*
INDICATED EFFECTIVE AGE		13 years**

* Percent remaining equals Net Cost ÷ Current Cost x 100

$16.5 ÷ 39.4 = 41.9%

** 13 years is the indicated effective age on the 15 year life table when percent remaining is 41.9%.

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Zero start depreciation provides for an automatic proration of the effective age of the entire facility and, where appropriate, extension of its remaining life. It produces essentially the same depreciated value as would be achieved by periodic reviews of the facility and estimation of the remaining life of the facility in place. Its benefits are two-fold - ease of administration and maximum use of the data and staff available. Zero start depreciation represents a practical application of valuation principles in the context of mass appraisal.

The key to successful implementation of zero start depreciation is the determination of a threshold below which additions are assumed to have no effect on remaining life. Additions falling below the threshold should be depreciated on the basis of the remaining life of the total facility. Only those additions installed in order to extend, or having the effect of extending the age life of the plant should be subject to zero start depreciation. In quantitative terms, an addition that should be depreciated on the zero start basis will constitute a significant proportion of the total assessed value of the facility.

Buildings

In many instances, particularly in the oil and gas industry, a building housing machinery and equipment is structurally integrated with the machinery such that it must be altered when the machinery is replaced or modified. The structure should be depreciated on the same basis - age life, table and residual value as the machinery.

RECOMMENDATIONS

1. Electric Power Industry

The electric power industry in Alberta was represented by TransAlta Utilities Corporation of Calgary. TransAlta made representations to the Department in late 1980 and early 1981 with respect to the depreciation of its machinery and equipment and the following recommendations are based on those submissions.

Recommendation 1.1

Age Life

(a) The age life for thermal plants and substations, including the machinery and equipment within the substations and plants, and for communications equipment will be thirty years.

(b) The age life for hydro plants, including the machinery and equipment within the plants will be fifty years.

Recommendation 1.2

Depreciation Table

(a) Thermal plants, substations and communications equipment will be depreciated in accordance with the thirty year depreciation table as approved for regulatory use by the Alberta Public Utilities Board (see table 1).

(b) Hydro plants will be depreciated in accordance with the fifty year depreciation table approved by the Public Utilities Board (see table 2).

Recommendations 1.3

Residual Value

The maximum depreciation for all electric power plant machinery and equipment will be 75 percent. Beginning with the twenty-third year, thermal plant and machinery, substations and machinery and communications equipment will be depreciated at a fixed rate of 75 percent - the remaining life is fixed at 25 percent - until the plant, machinery or equipment is removed from service (see table 1). Hydro plants will begin to experience a fixed rate of 75 percent depreciation after 47 years.

TABLE 1
DEPRECIATION SCHEDULE
THERMAL PLANTS, SUBSTATIONS, COMMUNICATIONS EQUIPMENT

AGE (Years)	REMAINING LIFE (%)	AGE (Years)	REMAINING LIFE (%)	AGE (Years)	REMAINING LIFE (%)
1	97	18	40	35	12
2	93	19	37	36	11
3	90	20	33	37	10
4	87	21	30	38	9
5	83	22	27	39	8
6	80	*23	23	40	8
7	77	24	20	41	7
8	73	25	19	42	6
9	70	26	18	43	5
10	67	27	18	44	5
11	63	28	17	45	4
12	60	29	16	46	3
13	57	30	15	47	2
14	53	31	15	48	2
15	50	32	14	49	1
16	47	33	13	50	0
17	43	34	12		

* Beginning with Year 23 the remaining life will be fixed at 25%

TABLE 2
DEPRECIATION SCHEDULE
HYDRO PLANTS

AGE (Years)	REMAINING LIFE (%)	AGE (Years)	REMAINING LIFE (%)	AGE (Years)	REMAINING LIFE (%)
1	98	26	50	51	23
2	96	27	47	52	22
3	94	28	46	53	21
4	92	29	44	54	21
5	90	30	43	55	20
6	88	31	41	56	20
7	86	32	40	57	19
8	84	33	38	58	19
9	82	34	37	59	18
10	80	35	36	60	18
11	78	36	35	61	17
12	76	37	33	62	17
13	74	38	32	63	17
14	72	39	31	64	16
15	70	40	30	65	16
16	68	41	29	66	15
17	66	42	28	67	15
18	64	43	28	68	14
19	62	44	27	69	14
20	60	45	26	70	13
21	59	46	26	71	13
22	57	47	25	72	12
23	55	*48	24	73	12
24	53	49	24	74	12
25	51	50	23	75	11

* The remaining life will remain fixed at 25% as of Year 48

2. Oil and Gas Industry

Recommendation 2.1

Age Life

The age life of oil and gas production field machinery and equipment downhole pipe, field gathering pipeline, batteries and gas plants will be twenty years. The oil and gas facility is one entity from the bottom of the well to the transmission line and should be depreciated on the same criteria.

Recommendation 2.2

Depreciation Table

Production field machinery and equipment, downhole pipe, field gathering pipeline batteries and gas plants will receive normal depreciation be depreciated according to the twenty year declining balance table.

Recommendation 2.3

Residual Value

The maximum normal depreciation for production field machinery and equipment, downhole pipe, field gathering pipeline, batteries and gas plants will be sixty-five percent. Beginning with the twenty-first year, the machinery and equipment will be depreciated at a fixed rate of sixty-five percent (thirty-five percent remaining) until it is removed from service.

2.4 Additions

Additions to machinery or equipment that extend the life of the operating facility shall be depreciated on a "zero start" basis.

2.5 Buildings

Buildings that are structurally integrated with the machinery and equipment and buildings that have no alternative use to housing machinery and equipment should be depreciated on the same basis as the machinery and equipment.

2.6 Application

The committee strongly recommends that, because of the diverse nature of production field machinery and equipment, the recommendations 2.1 through 2.5 be implemented as a complete package.

3. General Recommendations

3.1 Age Life

The age life of machinery and equipment other than the electric power generation and oil and gas production industries shall be as shown in table 3. The Committee strongly urges the Department to review these age lives in consultation with industry representatives as and when the age lives are queried or when data becomes available to indicate that the age lives should be reconsidered.

3.2 Depreciation Table

Machinery and equipment utilized by industry other than electric power should be depreciated on a declining balance basis in conjunction with the age life in table 3. Again, if the Department receives information that some basis other than the declining balance is a more appropriate pattern, it should be reviewed.

3.3 Residual Value

The depreciation of machinery and equipment should never exceed sixty-five percent so long as it remains in service.

TABLE 3
AGE LIFE OF INDUSTRIAL PLANTS

PLANT	AGE LIFE (Years)
Acid Plant	20
Breweries	25
Brick Plants	25
Canneries	20
Chemical Plants	20
Cement Plants	20
Coal Processing	20
Distilleries	25
Dairy, Creamery	25
Feed Mill	25
Fertilizer Plant	15
Flour Mills	25
Gas Injection	20
Gas Compression	20
Insulation Plants	20
Meat Packers	25
Oil Sand Processing	20
Oilfield Batteries	20
Plywood Manufacturing	20
Pulp Mills	15
Pelitizing Plants (Feed)	20
Refineries (Metal)	15
Refineries (Sugar)	20
Roofing Plants	20
Soft Drink Plants	20
Sulphur Plants	15
Steel Production	20
Tire Plant	15
Wallboard Manufacturing	20

Appendix 1

Membership

Advisory Committee on the Depreciation of

Industrial Plant and Equipment

Angus MacKay	Alberta Municipal Affairs,	chairman
Alvin Harke	County of Leduc	representing the Rural Assessor Association
George Megley	City of Edmonton	
Frank MacLeod	Texaco Canada Resources Ltd.	representing the Canadian Petroleum Association
Bill Johnstone	Home Oil Co. Ltd.	representing the Independent Petroleum Association of Canada
Peter Cormack	Gulf Canada Ltd.	representing the Canadian Property Tax Agents Association
Dan Levson	TransAlta Utilities	
Bill Jesse	Alberta Municipal Affairs	
Jim Swelin	Alberta Municipal Affairs	
Norm Jensen	Alberta Municipal Affairs	

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APPENDIX 2
COMPARISON OF DEPRECIATION PROPOSALS

Fixed and Immediate Depreciation	Canadian Petroleum Association Canadian Property Tax Agents Association Opposed	Assessment Division Opposed	Rural Assessors AAMD and C Endorsed	Recommended Policy Rejected
AGE LIFE	20 years	20 years	Not applicable	20 years
DEPRECIATION TABLE	Straight Line	Declining Balance	Fixed and Immediate Depreciation	Declining Balance
RESIDUAL VALUE	25%	none	Not Stated Assume for F&I 50% or Higher	35%
COVERAGE	Well Head Facilities Well Pipe Gathering Lines Gas Plants Batteries	Well Head Facilities Gas Plants Batteries	All Facilities of the Oil/Gas Industry	Well Head Well Pipe Gathering Lines Gas Plants Batteries
BUILDINGS	Industrial buildings be depreciated on the same basis as the machinery and equipment in the building	Industrial buildings be depreciated according to the age life warranted by the structure, its design and materials used in construction	Industrial buildings be depreciated at the same rate as machinery and equipment	Industrial buildings that are structurally integrated with the machinery be depreciated on the same basis as the machinery
Additions	The effective age of the facility be reviewed at the time of major additions and general assessments	Additions that would extend the effective age of a facility be depreciated on a 'zero start' basis	Not Applicable	Zero start

Appendix 3

Submissions

Canadian Petroleum Association/Independent Petroleum Association of Canada/Canadian Property Tax Association, A Proposal for Depreciation Oil and Gas Facilities

Rural Assessors Association, A Proposal for Fixed and Immediate Depreciation in the Assessment of Industrial Properties

Assessment Services Division, Depreciation Submission

A PROPOSAL FOR DEPRECIATION

OIL AND GAS FACILITIES

INTRODUCTION

The Advisory Committee on Industrial Plant and Equipment Depreciation was formed with the following objectives in mind:

1. To review the age life estimates used by the Assessment Services Division and recommend appropriate changes.
2. The review of the depreciation methodology used by the Division and recommend appropriate policies and procedures.
3. To recommend a policy for the depreciation of buildings housing machinery and equipment.
4. To consider the feasibility of a separate conversion factor for plant and equipment distinct from the factor used for industrial improvements.

DISCUSSION

Industrial plant and equipment assessed under the Municipal Taxation Act has been depreciated on the basis of age life estimates prepared by the Industrial Assessment Section of the Assessment Services Division using depreciation tables which were developed for application to structures. Equipment assessed under the Electric Power and Pipeline Assessment Act, through a new general assessment, is receiving a 25% fixed and immediate depreciation allowance.

PROPOSAL

The following is a summary of a proposal for the depreciation of oil field facilities including machinery and equipment, downhole and lateral pipelines, buildings and plants for property assessment and taxation in Alberta.

It is recommended:

1. That a straight line depreciation method be used, based on a 20 year life.
2. That industrial property be depreciated to a maximum of 25% remaining, as long as the property is in use.
3. That industrial property be subject to annual depreciation.
4. That pipelines, including downhole and surface lines, be depreciated as industrial oilfield equipment.
5. That industrial buildings, being essentially adjuncts to the machinery and equipment in the buildings, be depreciated by the same method and at the same rate as the machinery and equipment contained therein.
6. That normal additions to industrial plants and equipment be depreciated based on the termination date of the original installation.
7. That the age life of the original facilities be reviewed if additions are designed to prolong the life of the reserves or facilities.
8. That all facilities within the same pool or field area be depreciated using the same rates, methods and age life.

A PROPOSAL FOR DEPRECIATION

OIL AND GAS FACILITIES

In the determination of depreciation applicable to oil and gas field facilities, (defined for purposes of this study to include industrial machinery, equipment, buildings, downhole and lateral pipelines and gas plants), numerous approaches to depreciation were investigated. The following is a summary of those investigations and results.

DESIGN LIFE

When engineers design machinery and equipment to be incorporated into industrial facilities they normally provide for wear and tear, corrosion, and other factors by anticipating a 20 year life for the facility. The twenty year design life also takes into account technological advances in design, efficiency, etc., which often causes the facility to be functionally obsolete at the end of the 20 year period. Exhibit "A" attached supports the foregoing statements.

CONTRACT LIFE

Contracts for the sale of gas are based upon the established recoverable reserves of the reservoir to be contracted. Under the contract, the buyer agrees to purchase 1,000 MCF of gas per day for each 7,300,000 MCF of established recoverable saleable reserves. Thus, under such contracts, the gas reserves are contracted to

be depleted in 20 years. Exhibit "B", attached, is an extract from a typical gas sales contract setting out the arrangement in more detail.

RESERVES

The useful life of gas and oil producing and processing facilities including machinery, equipment, down hole pipe, gathering and flow lines, dehydrators, separators, treaters, tanks, buildings, and gas plants are tied directly to the time it takes to deplete those reserves. Once the reserves are depleted, the facility has little or no value. The down hole pipe and gathering systems are normally abandoned in place and the surface equipment is not normally used in new fields because of the danger of equipment failure. Generally, at the end of the reserve life, equipment is either worn out or corroded to such an extent that it cannot be re-used. The cost of tearing out a facility often exceeds its salvage value.

A study was made to determine the depletion rates for major oil and gas fields in Alberta. This study, based on Energy Resources Conservation Board and Alberta Society of Petroleum Geologists publications, indicates the average depletion rate to be 4.14% per year for gas and 3.02% per year for oil reservoirs. Those depletion rates establish the 'bottom line' for the useful life of the facilities serving those reservoirs. Attached, as Exhibit "C", is a copy of the detailed study.

RETIREMENTS

A survey of retirements of equipment servicing the oil and gas reservoirs was made. Included in the survey was equipment such as diesel motors, gas plants, tank batteries, pipelines, etc. The study provides reasons for retirement, age-life, etc. The useful life of the equipment ranges from 8 years to 24 years and clearly supports an average life of 20 years or less for the facilities. Attached, as Exhibit "D", is a copy of the study.

RECOMMENDATIONS

The industry recommends an annual depreciation rate for oil and gas producing and processing facilities of 5%, straight line, to a maximum of 75%. It is recommended that the rate be applied to all oil and gas field machinery, equipment, buildings, pipelines (including down hole pipe, flow lines, gathering lines), gas plants and other facilities which service the oil or gas reservoir. The foregoing rates include normal wear and tear and functional obsolescence. Economic obsolescence is not included and assessors should be instructed to make an allowance for economic obsolescence when present.

APPLICATION

It is recommended that all facilities serving a specific oil or gas reservoir be depreciated as a unit. That is: the recommended 5% straight line depreciation be allowed annually on all of the original equipment servicing a reservoir, to a maximum of 75%. Under this proposal all original facilities would be deemed to have a 20 year life. Added facilities, which do not add to the useful life of the original facility, would be assigned the same year of termination as the original and depreciated accordingly until the 25% residual is reached. If the added facilities prolong the useful life of the original installation an adjustment, based upon engineering estimates, would be made to the original age-life. Attached is Exhibit "E", illustrating the application of the proposal.

SUMMATION

The recommendation based upon the results of the industry study, more accurately reflect the actual decline in value applicable to facilities associated with oil and gas production and reserves. The proposed rates and methods recognize that the life of those facilities is tied directly to the oil and gas reserves which they service as well as to the wear, tear and corrosion associated with machinery and equipment. The annual straight line depreciation is characteristic to the valuation of machinery, equipment and reserves.

The 25% residual, so long as the facilities are in use, makes allowance for the fact that facility and reserve life will vary to some extent and provides that the facilities will remain on the assessment roll at a reasonable level as long as the facilities are in use.

The foregoing recommendations are subscribed to by:

Canadian Petroleum Association

Independent Petroleum Association

Canadian Property Tax Agents Association

ESSO RESOURCES CANADA LIMITED

Production Department

500 SIXTH AVENUE SOUTHWEST, CALGARY, CANADA
T2P 0S1

G. L. HAIGHT
Vice-President and General Manager
D. D. BALDWIN
Assistant General Manager

1981 02 09

Mr. T.J. Robert
Tax Department ~~(5-12)~~
Imperial Oil Limited
~~P.O. Box 4029~~
~~Toronto, Ontario~~
~~M5W 1K3~~ Edmonton

Dear Mr. Robert:

PIPELINE LIFE EXPECTANCY

Further to our conversations I would like to highlight the following information.

Although there are special cases of extremely aggressive pipeline corrosion, in general since cathodic protection is used on Esso pipelines and gathering systems the life of most systems has been at least 20 years.

The working environment today is more corrosive due to high water/oil ratios and corrosive elements in the product such as H_2S and CO_2. Externally and internally coated pipe, inert materials, cathodic protection, and corrosion inhibition, are being used, however, to maintain a general 20 year design life for new systems. Shorter design lives may be used on short term projects.

Since exotic, life extending materials tend to add to the initial costs of a project, and new technolgies tend to antiquate existing systems, the 20 year design life has been found to be an economic optimum.

We hope you find the information useful, and will be glad to be of any further assistance.

Yours very truly,

G.A. Hamilton, Supervisor
Materials Engineering

G.B. Petterson

GBP/sk

EXHIBIT "A"

Exhibit D

ARTICLE IV - QUANTITY OF GAS

4.1 (i) Subject to the other provisions of this Contract, from and after the date upon which Seller is first obligated to deliver and Buyer is first obligated to take gas hereunder, Buyer agrees to take and pay for, or nevertheless to pay for, if available and not taken, a daily quantity of gas (hereinafter called "the minimum daily quantity"), averaged over each contract year, equal to one thousand (1,000) Mcf for each seven million, three hundred thousand (7,300,000) Mcf of the recoverable, saleable pipe line gas originally in place as determined from time to time pursuant to Article XV hereof.

(ii) Seller covenants and agrees with Buyer that Buyer shall have the right, from and after the date upon which Seller is first obligated to delivwr gas hereunder, to purchase from Seller, and Seller will sell and deliver to Buyer from Seller's lands, gas at such rates per day as Buyer may elect up to the maximum rate per day (hereinafter called "the maximum daily rate") equal to one hundred and twenty-five per cent (125%) of the minimum daily quantity then applicable under the provisions of this Contract.

In this Contract the words 'maximum daily quantity" shall mean the maximum quantity of gas which Seller would be obligated to deliver to Buyer in any day if Buyer requested Seller to deliver gas at the maximum daily rate during such day and the words "requested daily quantity" shall mean the quantity of gas which would be delivered to Buyer in any day if Seller delivered gas to Buyer during such day at the rate or rates requested by Buyer.

4.2 Buyer, consistent with the operation of its pipe line system, shall take gas as nearly as practicable at uniform hourly rates of flow and at uniform daily deliveries, but it is understood that if during any one (1) contract year Buyer fails to take the quantity of gas which it is required to pay for if available and not taken during such contract year (hereinafter called "Prepaid Gas"), Buyer shall have the right during the remainder of the term of this Contract, after complying with the minimum take or pay for obligations applicable during each particular succeeding contract year, to receive the total quantity of gas paid for but not received; provided that Seller shall not be obligated to deliver to buyer in aggregate in any day a quantity

EXHIBIT C

DEPLETION RATE
ALBERTA GAS FIELDS

* SOURCE: ERCB PUBLICATION 80-18 TABLE 4-2
ALBERTA RESERVES AT DECEMBER 31, 1979
** SOURCE: GAS FIELDS OF ALBERTA, ALBERTA SOCIETY
OF PETROLEUM GEOLOGISTS 1969

PRODUCING FIELD/ZONE		INITIAL RECOVERABLE RESERVES $10^6 m^3$	CUMULATIVE PRODUCTION $10^6 m^3$	PERCENT DEPLETED	YEAR PROD. COMMENCED	YEARS ON PROD.	PERC DEPL'N
BRAZEAU RIVER	ELKTON SHUNDA B TTL.	35700	10987	30.7	1973	6	5.1
CARSTAIRS	ELKTON A	23100	17776	76.9	1960	19	4.0
CESSFORD	BASAL COLORADO A ASSOC.	16600	14721	88.6	1958	21	4.2
COUNTESS	BASAL COLORADO A ASSOC.	4090	3823	93.4	1959	20	4.6
CROSSFIELD	RUNDLE A	27000	17117	63.3	1957	22	2.8
DUNVEGAN	DEBOLT TTL.	25400	7290	28.7	1973	6	4.7
EDSON	ELK A-SHUN A & B TTL.	48100	29001	60.2	1965	14	4.3
GILBY	JURASSIC-RUNDLE C	9020	6506	72.1	1960	19	3.7
HAMMATTAN EAST	RUNDLE ASSOC.	24800	5852	23.5	1964	15	1.5
HOMEGLEN RIMBY	D-3 ASSOC.	22100	19221	86.9	1961	18	4.8
JUMPING POUND	MISSISSIPPIAN TTL.	17500	12451	71.1	1947	32	2.2
MARTEN HILLS	WABISKAW A WABAMUM A	24200	11019	45.5	1970	9	5.0
MINNEHIK-BUCK LAKE	PEKISKO A	19700	10983	55.7	1961	18	3.0
STRACHAN	D-3A	30100	18829	62.5	1972	7	8.9
THREE HILLS CREEK	PEKISKO	2210	1610	72.8	1961	18	4.0
WATERTON	RUNDLE & WABAMUM	48900	25288	51.7	1960	19	2.7
							66.1

AVERAGE = $\frac{6619}{16}$ = 4.14% DEPL'N/YEAR

0002C

DEPLETION RATE

SELECTED ALBERTA GAS FIELDS

SOURCE: ERCB PUBLICATION 80-18 TABLE 2-1
ALBERTA RESERVES AT DECEMBER 31, 1979

PRODUCING FIELD/ZONE		INITIAL RECOVERABLE RESERVES 10^6m^3	CUMULATIVE PRODUCTION 10^6m^3	PERCENT DEPLETED	YEAR PROD. COMMENCED	YEARS ON PROD.	PERCEN DEPL'N
ACHESON	D-3A	17300	12818	74.0	1954	25	2.96
BONNIE GLEN	D-3A	80700	52340	64.8	1953	26	2.49
CARSON CREEK	BEAVERHILL LK. B	19900	10925	54.8	1959	20	2.74
FENN-BIG VALLEY	D-2A	42000	29991	71.4	1954	25	2.85
GOLDEN SPIKE	D-3A	33500	26416	78.8	1953	26	3.03
JUDY CREEK	BEAVERHILL LK. A	62000	37211	60.0	1959	20	3.00
KAYBOB	BEAVERHILL LK. A	20000	12023	60.1	1959	20	3.00
LEDUC-WOODBEND	D-3A	37000	36485	98.6	1949	30	3.28
MITSUE	GILWOOD A	54200	28579	52.7	(1964)	(15)	(3.51)
NIPISI	GILWOOD A	47100	25438	54.0	(1965)	(14)	(3.85)
PEMBINA	CARDIUM TOTAL	239000	142598	59.6	1955	24	2.48
RAINBOW	KEY RIVER B	25600	14049	54.8	(1965)	(14)	(3.91)
REDWATER	D-3	128000	109163	85.2	1949	30	2.84
STURGEON LK. SOUTH	D-3	24900	14835	59.5	1956	23	2.58
SWAN HILLS	BEAVERHILL LK. A & B	127000	67956	53.5	1959	20	2.67
TURNER VALLEY	HUNDLE	20700	20628	99.6	1949	30	3.32
VIRGINIA HILLS	BEAVERHILL LK.	30000	16431	54.7	1959	20	2.73
WESTEROSE	D-3	17000	12313	73.0	1959	20	3.65
WIZARD LAKE	D-3	51300	34699	67.6	1952	27	2.50
							57.39

AVERAGE = $\frac{5739}{19}$ = 3.02% DEPL'N/YEAR

Year Production Commenced
Reference - Oil Fields of Alberta 1960 by the Alta. Society of Petroleum Geologists
- Index Schedule of Wells 1949 - 1959 by Oil and Gas Conservation Board Province of Alberta
- ( ) Discovery Year per Table 2 Alberta Reserves 1979 by Energy Resources Conservation Board

0002C

EXHIBIT D

EXHIBIT D

Depreciation Study.
Survey of Equipment Retired.

	Type of Equipment	Reason Retired.	Year Installed	Year Retired	Age.
4	Diesel Power Units.	Obsolete	1951	1974	23
24	Diesel Power Units.	Obsolete - Repair Parts Not Available		1972	21
	Water Pump Station 20" Water Line	No longer required due to production decrease	1970	1981	11
	Gas Plant Including Buildings	Field Decision	1961		
			1962	80	18
			1963		
			1963		
	Booster Compressor Inc. Building.	Field Decision	1962	80	17
	Tank Battery	Field Decision	1963	80	17
	Gas Plant.	Used not obsolete. Too costly to recover. To be used as stand by	37 1954 1 56 26 70 10 72 14 74 12 75	1973	19
5	Batteries.	Unitization not required.	1953	1972	19
2781'	6" Line Pipe Gas Gathering				
166	8" " " "				
3554'	12" " " "				
5761'	12" " " "				
94833	8" Flowline				
10	Batteries.	Consolidation not effected.	1954	1974	19
6119'	6" Line Pipe Gas Gathering				
5976'	8" " " "				
8570	10" " " "				

2

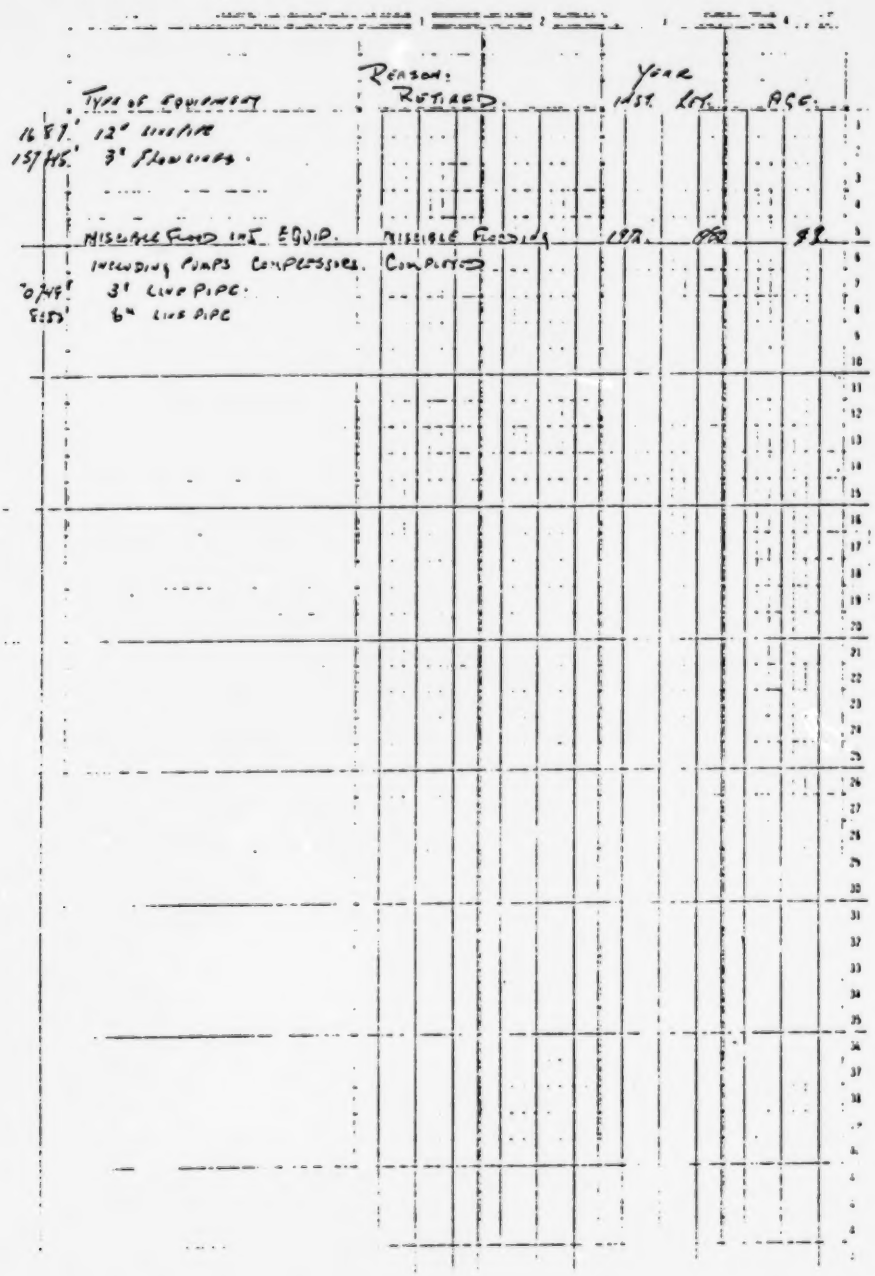
TYPE OF EQUIPMENT
REASON RETIRED
YEAR 1ST. INST.
LIFE
AGE
1687' 12" SUCTION
1571/4" 3" FLOW LINES
MISCELLANEOUS INT. EQUIP.
INCLUDING PUMPS COMPRESSORS.
0/48' 3" LINE PIPE
5251' 6" LINE PIPE
POSSIBLE FLOODING
COMPLETED
1971
100
82

EXHIBIT E

Year		Depr.	Value	Depr.	Value	Depr.	Value	Total
19 80	Original Investment 20 Year Life	100	100000					100000
19 81		.95	95000					95000
19 82		.90	90000					90000
19 83		.85	85000					85000
19 84		.80	80000					80000
19 85	Addition To Plant Which Does Not Effect Age Life	.75	75000	100	10000			85000
19 86		.70	70000	.93	9300			79300
19 87		.65	65000	.87	8700			73700
19 88		.60	60000	.80	8000			68000
19 89		.55	55000	.73	7300			62300
19 90	Addition To Plant Which Extends The Age Life Of The Plant An Additional 5 Yrs. Change To 25 Year Life.	.60	60000	.75	7500	100	50000	117500
19 91		.56	56000	.70	7000	.93	46500	109500
1992		.52	52000	.65	6500	.87	43500	102000
1993		.48	48000	.60	6000	.80	40000	94000
1994		.44	44000	.55	5500	.73	36500	86000
1995		.40	40000	.50	5000	.67	33500	78500
1996		.36	36000	.45	4500	.60	30000	70500

EXHIBIT "E"

EXHIBIT "E"

Year	Depr.	Value	Depr.	Value	Depr.	Value	Total
1997	.32	32000	.20	7000	.53	26500	62500
1998	.25	25000	.35	3500	.47	23500	55000
1999	.25	25000	.30	3000	.40	20000	48000
2000	.25	25000	.25	2500	.33	16500	44000
2001	.25	25000	.25	2500	.17	13500	41000
2002	.25	25000	.25	2500	.25	12500	40000
2003	.25	25000	.25	2500	.25	12500	40000
2004	.25	25000	.25	2500	.25	12500	40000
2005	.25	25000	.25	2500	.25	12500	40000

A PROPOSAL FOR FIXED AND IMMEDIATE DEPRECIATION

IN THE ASSESSMENT OF INDUSTRIAL PROPERTIES

---

1. UNIFORMITY

Wellhead installations, pipelines and transmission lines are depreciated at a fixed and immediate rate of depreciation.

Residential and commercial properties are depreciated at the time of a general assessment, often for a ten year period or longer.

Under the present method, machinery and equipment receive annual depreciation which in some cases, reduces the assessment by 50% during the term of an assessment.

There seems to be no uniform rate of depreciation applied to machinery and equipment throughout the Province.

2. ADMINISTRATION

Allowing annual depreciation, whether straight line or declining balance method, is a time consuming procedure. Throughout the Province, there are a large number of installations serving the petroleum industry. In many cases,

these installations are constructed of new and used equipment. Machinery and equipment being moved from one site to another is not uncommon. This becomes another concern for the assessor to determine the age of this equipment and apply a rate of depreciation.

3. BUILDINGS, STRUCTURES, MACHINERY AND EQUIPMENT DEPRECIATED AT THE SAME RATE

Industrial buildings are generally special type buildings. These buildings have limited use after the machinery and equipment is removed due to the design and location. In some cases, the building has to be dismantled to remove the machinery.

Construction costs are not always available, as to the breakdown of costs for machinery, equipment, buildings and structures. This then becomes a problem for the assessor to allocate costs to the various items.

4. FACILITY IN USE

When a new industrial facility becomes assessable and taxable, the revenue for the municipality is the greatest in the first years of operation. Using a straight line method of depreciation, the assessment could be reduced by 50% in ten years and to zero in twenty years. Using the declining balance method of depreciation, the assessment would be reduced to 30% or less. There are plants operating very efficiently after twenty years of operation.

Listed are some of the facilities operating in the County of Leduc:

1. Pembina Pipe Line Pump Station constructed in 1955.
2. Goliad Fractionation Plant (Pembina Field) constructed in 1958.

3. Keystone Gas Plant (Pembina Field) constructed in 1966.

4. Berrymoor Gas Plant (Pembina Field) constructed in 1966.

5. Warburg Gas Plant (Pembina Field) constructed in 1972 of new and used material.

6. Western Decalta Leduc Gas Plant constructed in 1977 of new and used material.

SUMMARY

Municipalities require tax dollars to operate, which are derived mostly from property taxation. Assessment of farm land, residential and commercial properties, do not vary much during an assessment. As previously indicated, there could be a large variation in the assessment of machinery and equipment due to the present method of depreciation.

Municipalities have other options in raising tax revenue. One of these options could be the implementing of a business tax and the eliminating of taxation on machinery and equipment. There is also provision to vary the mill rate for different types of properties.

SUBMITTED BY:

A. H. HARKE

ASSESSOR

COUNTY OF LEDUC NO. 25

0002C

DEPRECIATION SUBMISSION

ASSESSMENT SERVICES

Areas Addressed:

(1) Depreciation Procedure

(2) Depreciation Tables

(3) Age Life Schedules

(4) Building Age Life

(5) Minimum Value

(6) "Fixed and Immediate" Depreciation

(1) DEPRECIATION PROCEDURE

The effective age approach to measuring depreciation poses many problems to implement on a mass appraisal approach.

e.g. (a) A constant survey of the total plants and installations in the would be required.

(b) Judgement is required periodically as to when effective ageing should take place for each installation and plant.

The present procedure of "zero start" for new components is a practical method for prorating depreciation rather than periodic effective ageing.

The "zero start" for new components process is a continual prorating of new components that is practical on the mass basis required for assessment. Although one new component in a large plant has little effect on the effective age of that total plant, when enough new components are added they do have an affect and prorating from a "zero start" takes this into account without having to re-evaluate the actual total plant.

Following is an example of prorating for a plant that has long passed its original age life but is still operating at full capacity.

ST. REGIS PULP MILL

HINTON, ALBERTA

Machinery and Equipment

1956 - orginal cost - 1963 level	$16,069,660
Additions and deletions through to 1980	$23,365,460
Present 1963 costs less deletions	$39,435,120
Total present depreciation	$22,915,805
1963 costs less total depreciation	$16,519,315
Total present percent remaining	41.9%
Age life on original and additions	15 years
Present age of plant	24 years

41.9% in 15 years age column - effective age = 13 years

The above illustration shows how "zero start depreciation" for new components has a built-in prorating or effective age system for a plant.

(2) DEPRECIATION TABLES

Assessment Services agreed that the depreciation schedule found in the 1979 edition of the Assessment Manual has been identified as a schedule that applies to improvements and does not reflect the depreciation of industrial machinery and equipment.

As a result, Assessment Services agrees with this and has examined alternative tables. The declinign balance table, as found in the 1967 edition of the Assessment Manual, has been used successfully for plat assessment for many years. Further reviews, studies and comparisons have been made by Assessment Services and this table appears to be the best to fairly measure depreciation of machinery and equipment.

Nevertheless, Assessment Services is aware that certain industries may have different circumstances which affect the depreciation of their equipment. For example, the power companies have submitted sufficient data to support the use of the Iowa 30 S-Curve schedule for their specific plant and equipment.

It is our submission that the option remain open to any other industry to show why their machinery and equipment should be depreciated by schedules other than the declining balance table in the 1967 Manual.

(3) AGE LIFE TABLES

The present guideline found in the 1979 Assessment Manual is the result of a review by Assessment Services in 1980. The guideline is open to the committee for further input, but at present, there appears to be no reason for changing them.

(4) BUILDING AGE LIFE

It is recognized that buildings housing equipment presently are given an age life much longer than the equipment. The present age life of buildings is established by the assessor according to the material and structure of the building and anticipated length of its physical life.

Our submission is to continue with this approach and when obsolescence occurs it will be handled at that time, rather than trying to recognize anticipated obsolescence in the buildings.

(5) SALVAGE VALUE OF MINIMUM VALUE

It is our submission that no minimum value be artifically maintained on equipment. However, if the assessor believes an item of equipment has reached its maximum depreciated level and a salvage value exists, it would be his prerogative to maintain and support this value.

(6) FIXED AND IMMEDIATE DEPRECIATION

We believe we cannot support any further areas to be covered by fixed and immediate depreciation.

In our view, "fixed and immediate" is an artificial means of applying depreciation where it is administratively impossible to measure it in the normal approach to value.

We believe our submitted approach to depreciation and our past methods do, in most cases, reflect actual depreciation.

SUMMARY

We recognize that the standardization of depreciation approaches to maintain equity is necessary considering the number of properties to be valued. However, we see a great value and importance in leaving room in our recommendation for the application of the assessor's judgement.